



DEVAR-KINETICS DIVISION

CONSOLIDATED ELECTRODYNAMICS CORPORATION
706 BOSTWICK AVE., BRIDGEPORT, CONNECTICUT

INDICATING CONTROLLERS TYPES 18-401 THROUGH 18-405



TYPE	DASH	MOD.	DESCRIPTION	PRICE		CURRENT DRAIN (MA)	
			CONTROLLER TYPES			+18 V	-18 V
18-401			Proportional Controller	\$330	00	47	44
18-402			Proportional plus Fast Reset	400	00	47	44
18-403			Proportional plus Slow Reset	430	00	47	44
18-404			Proportional plus Fast Reset plus Rate	535	00	56	54
18-405			Proportional plus Slow Reset plus Rate	560	00	56	54
			INPUT OPTIONS (Only one per controller)	ADD ON		ADDED DRAIN	
	-1		0-10 volts	--		--	--
	-2		Milliamps (1-5, 4-20, 10-50 ma)	35	00	6	16
	-3		Millivolts or Thermocouple	285	00	19	27
	-4		Pulse Rate	275	00	34	31
	-5		Milliamp and Square Root	275	00	40	31
	-6		Millivolt and Square Root (except Types 18-404, 18-405)	520	00	53	42
	-7		Voltage Inputs with buffer amplifier	25	00	4	4
			ELECTRICAL MODIFICATIONS	ASSEMBLY LOCATION	+ADD ON -DEDUCT		
	E1		Delete upper 2 3/8" indicator	(31)	- 13 50	(1)	--
	E2		Delete lower 2 3/8" indicator	(33)	- 15 00	--	--
	E3		Add set point retransmission buffer amplifier	(8) (9)	+ 20 00	4	4
	E4		Substitute 4-20 ma output	(8) (9) (33)	+ 3 00	15	15
	E5		Substitute 0-10 volt output	(33)	+ 2 00	--	--
	E6		Add Thermocouple break protection (on -3 input controller only)	(1)	+ 6 00	--	--
	E7		Add resistance bulb bridge (on -3 input controller only)	(1)	+ 15 00	2	--
	E8		Substitute rate response to error for response to process only	(4) (5)	-- --	--	--
	E9		Delete manual control	(34) (36) (35)	- 16 00	--	(5)
	E10		Delete set point adjustor	(30)	- 47 00	(4)	--
	E29		Add safety resistor for strain gage excitation	(66)	+ 7 50	--	--
			MECHANICAL MODIFICATIONS				
	M1		Interchange indicators with 0-10 Linear and 0-100 Square Root scales	(30) (31)	+ 3 00		
	M2		Substitute alternative standard dials	(30)	+ 1 50		
	M3		Substitute special set point dial	(30)	+ 30 00		
	M4		Substitute special bezel color	(76)	+ 15 00		
	M5		Add air purge fitting		+ 8 00		
	M6		Delete left-hand trim strip	(74)	--		
	M7		Delete right-hand trim strip	(77)	--		

All Prices F. O. B. Bridgeport, Conn.
Minimum Order \$ 10.00

Terms net 30 days
Prices subject to change without notice

APPLICATIONS

These controllers are designed for general process control applications. They are available with a variety of input circuits. Provision is made also for a remote 0-10 volt set point input. Instruments feature no reset windup and negligible lag. For Set Point Memory, see Types 18-411 through 18-415. For controllers with Cascade Subpanel see Types 18-406 through 18-410.

INFORMATION DRAWINGS

Instruction Manual 18-400 990441
General Dimensions 222675-01

RELATED FUNCTION MODULES

19-101 Preamplifier
19-106 Pulse Rate Converter
19-601A Power Supply

SPECIFICATIONS: 18-401 THROUGH 18-405 CONTROLLERS

Input Conversion (0 to 10 volts without buffer)

Nominal range	0 to 10 volts d-c
Input resistance	6600 ohms with process indicator
Recommended source	less than 6 ohms

Input Conversion (0 to 10 volts with buffer) (66)

Nominal range	0 to 10 volts d-c (other ranges on request)
Input resistance	greater than 100 megohms
Recommended source	less than 10,000 ohms
Input current	less than 10^{-6} amperes

Input Conversion (1 to 5, 4 to 20, or 10 to 50 milliamperes) (66)

Input voltage drop	10 volts, maximum
Grounding	-input is circuit common

Input Conversion (other) (1) (2) (3)

See corresponding Function Module data sheets

Adjustable Set Point (30)

Dial	5.4" circular scale
Dial markings	0 to 100 percent in 100 divisions Type 18-402 has 0 to 10 square root marking unless modified (M2)
Linearity	$\pm 1\%$, best fit
Stability	a) 40 to 120°F, less than .5% per 50°F. b) With supply and load variations on 19-601A supply: less than .01%.
Resolution	0.1%
Dial drive	5 turns

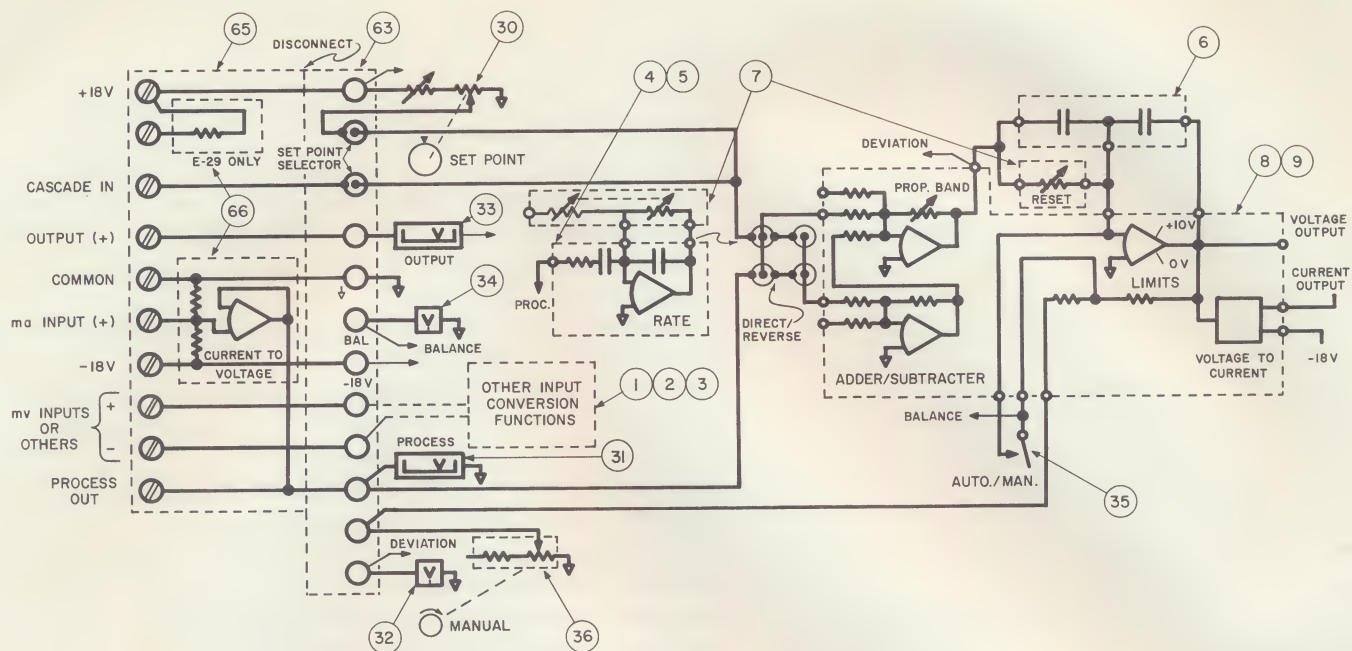
Internal/Cascade Selector (8) (9)

A screw selector connects either the internal or the cascade set point, (response to sum of both by wiring change)

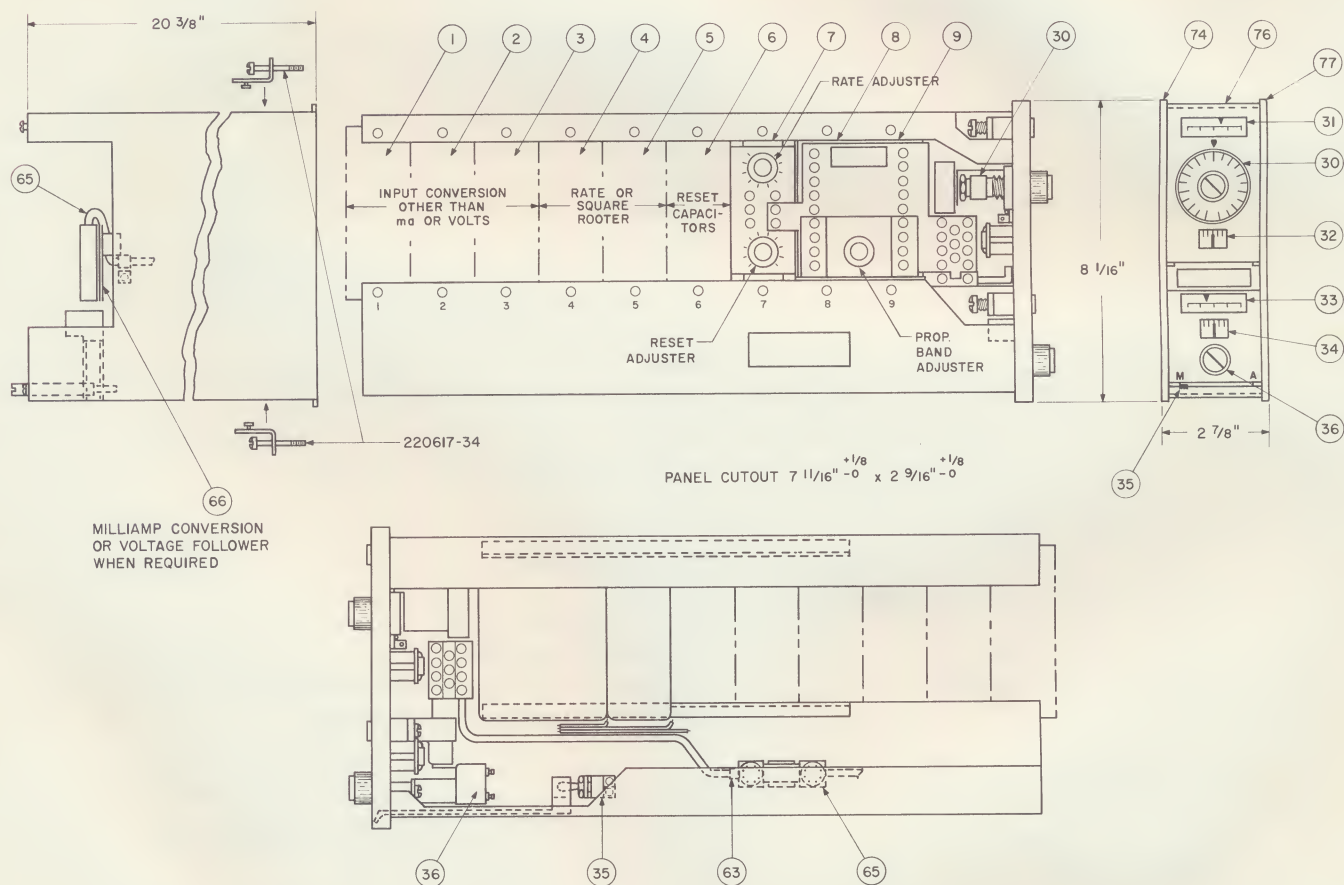
Process Indicator (31)

Scale length	2 3/8"
Scale marking	0 to 100 percent in 50 divisions Type 18-402 has 0 to 10 square root marking unless modified (M2)
Accuracy	$\pm 2\%$

Proportional-Reset Control	(8) (9)	
Proportional Band		2 to 2000% continuously adjustable
Reset rate		19-402 and 19-404 0.5 to 50 repeats/min in 9 steps 19-403 and 19-405 .05 to 5 rep/min in 9 steps
Zero offset		a) long term: less than $\pm 0.1\%$ b) Between 40 to 120°F., less than 0.2% per 50°F. c) With 19-601A supply variations: $\pm 0.01\%$ max.
Zero frequency gain		Greater than 10,000 times proportional gain reducing to 300 times at lowest repeats per minute at 120°F. (worst case)
Frequency response		Less than 3 db down at 15 kc (Preamplifier, Pulse Rate, Converter, Square Rooter further restrict bandwidth when used)
Output limits		Less than 10% outside of range.
Proportional Band repositioning		The circuit automatically anticipates return to zero deviation to speed recovery from saturation.
Tracking		Reset circuit tracks manual output within $\pm 0.2\%$ regardless of deviation
Proportional Control (Type 18-401)	(8) (9)	
Proportional Band		2 to 2000% continuously adjustable. Output is zero at zero deviation. Wiring can be altered to connect manual adjuster for manual reset (36)
Rate Control	(4) (5) (7)	
Circuit arrangement		Rate response to process only unless Mod. E8 is used. Rate and proportional response terms are added in the adder/subtractor circuit at location (8) (9)
Zero offset		Same as above as for reset
Rate gain		x30
Rate time		18-404 .09 to 2 or .009 to .2 min. in 10 steps 18-405 .9 to 20 or .09 to 2 min. in 10 steps
Manual Control	(36)	
Adjuster		5-turn, uncalibrated
Transfer switch		2-position
Balance indicator		Displays $\pm 10\%$ on 1" scale
Circuit arrangements		Employs reset amplifier
Auxilliary manual control		See Type 18-423 which permits removal of controller for service or modification
Output Conversion	(8) (9)	
Nominal range		1 to 5 milliamperes
Alternative range		4 to 20 milliamperes by replacing module (Mod E4)
Maximum load		2800 ohms (1 to 5 ma) 700 ohms (4 to 20 ma)
Common Level		Load circuit returns to the -18 volt supply connection



Schematic Diagram



Assembly Locations and Dimensions

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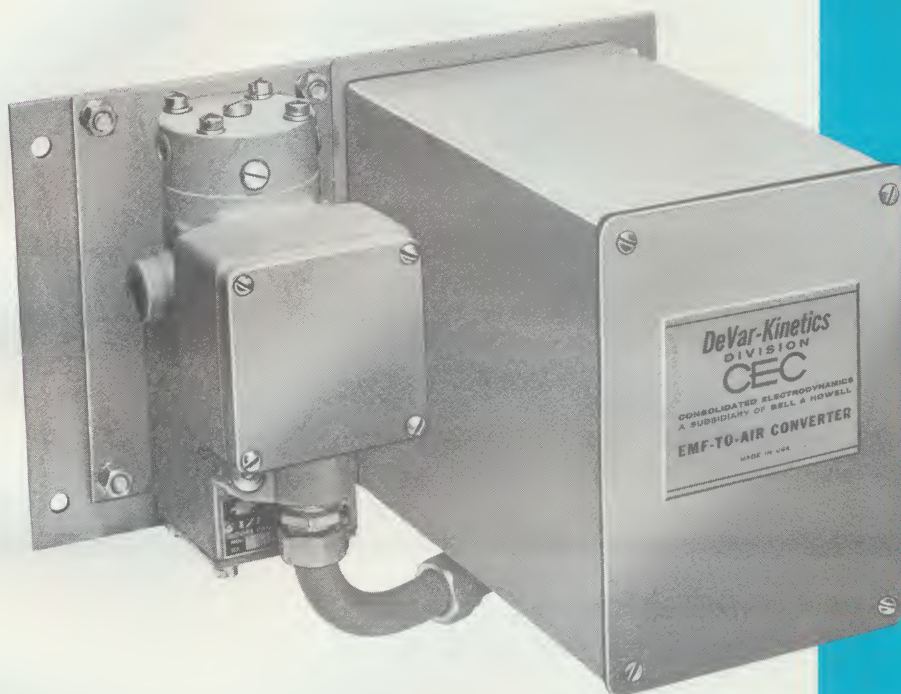
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DeVar EMF-TO-AIR CONVERTER

**Converts DC Millivolt Signals to
3-15 psig Pneumatic Output Signal**

- Solid state encapsulated function modules
- Operates through temporary power failures
- Fast response
- Continuous purging of case
- Fail-safe action on thermocouple burnout

The DeVar EMF-to-Air Converter measures DC millivolt signals from thermocouples, resistance thermometers, strain gages, optical pyrometers, pH amplifiers, and other process analyzers, and transmits a proportional pneumatic output signal.



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*For Prices and Ordering information, contact your local CEC Sales Office.
Domestic Sales and Service Offices are located throughout the United States.*

SPECIFICATIONS

Input	Span: 5 MV minimum, 50 MV maximum
Suppression	± 50 MV, but less than 3 times span (3 times span limitation may be waived where ambient temperature is constant)
Output	Calibrated for 3-15 psi output full scale
Reference Junction Compensation for I/C, C/C or C/A Couples	Accurate to 1°F for 50°F ambient change
Ambient Temperature Limits	20°F to 150°F
Power Requirements	110-120V, 50/60 cycles. Drain: less than 5 watts
DC Battery Reserve	Battery contained in power supply is continuously recharged by line power. Battery will maintain normal operation of up to 4 units operated from same power supply during power failure
Pneumatic	20 psi supply at .25 scfm air consumption

PERFORMANCE DATA

Linearity	$\pm 1/3\%$ full scale, based on a most favorable straight line
Hysteresis	0.1% full scale
Dead Spot	0.05% full scale
Ambient Temperature Effect	$\pm 1\%$ full scale per 50°F for a 20 MV input span
Supply Pressure Effect	For supply pressures between 18 and 22 psi, one psi supply pressure increase will change output not more than $\pm .02$ psi.
Supply Voltage Effect	Less than .01% full scale for line variation between 90 and 130 volts

